Notice No.3

Rules and Regulations for the Classification of Naval Ships, January 2019

The status of this Rule set is amended as shown and is now to be read in conjunction with this and prior Notices. Any corrigenda included in the Notice are effective immediately.

Please note that corrigenda amends to paragraphs, Tables and Figures are not shown in their entirety.

Issue date: June 2019

Amendments to	**Effective date**	**IACS/IMO implementation (if applicable)**
Volume 3, Part 2, Chapter 7 (Whole Chapter)	1 July 2019	N/A
Volume 3, Part 3, Chapter 2, Sections 1 & 2	1 July 2019	N/A

Lloyd's Register

Volume 3, Part 2, Chapter 7
Noise and Vibration Levels in Personnel Spaces

Existing Chapter 7 has been deleted in its entirety and replaced with the following.

Scope

The purpose of the **CEPAC2** notation is to enable compliance with the noise level limits and sound reduction indices set by *Resolution MSC.337(91) – Adoption of the Code on Noise Levels on Board Ships – (Adopted on 30 November 2012)* to be demonstrated, together with comfort levels benchmarked against relevant National and International Standards. CEPAC1 provides an enhanced level of comfort exceeding these standards.

■ *Section 1*
General requirements

1.1 General

1.1.1 These Rules set down the criteria for the assessment of noise and vibration levels on naval ships and are applied in addition to the other relevant requirements of the *Rules and Regulations for the Classification of Naval Ships, January 2019*.

1.1.2 These Rules apply to surface ships when engaged in peace-time mission profiles.

1.1.3 For NS2, NS3 or NS(SSC) vessels, higher noise and vibration levels will be permitted as allowed by *Resolution MSC.337(91) – Adoption of the Code on Noise Levels on Board Ships – (Adopted on 30 November 2012)* for vessels of between 1600 gt and 10,000 gt. Limits for these ships are identified within the text of these Rules.

1.1.4 The limits provided in these Rules do not take account of any external influences on noise or vibration such as weapons firing, aircraft operations or replenishment at sea activities.

1.1.5 These Rules recognise existing National and International Standards and specify levels of noise and vibration currently achievable using good engineering practice. Compliance with these requirements will be assessed by review of procedures, inspection and measurement of the relevant parameters. Pre-survey reviews, inspections and measurements will be conducted, witnessed or assessed by LR Surveyors.

1.1.6 These Rules present values of noise and vibration which should be verified by measurements following completion of the ship. It is recommended that the Builders undertake calculations of noise and vibration so that any potential problem areas can be identified and control measures implemented.

1.1.7 The sound pressure levels for audible alarms and public address systems fitted in accordance with other Sections of the Rules are to satisfy *IMO Resolution A.1021(19) Code on Alerts and Indicators, 2009* or other specified arrangements.

1.2 Definitions

1.2.1 Crew and embarked personnel spaces are defined as all areas intended for crew and embarked personnel use, and include the following:
(a) accommodation spaces (e.g. cabins, corridors, offices, mess rooms, recreation rooms);
(b) work spaces;
(c) navigation spaces.

1.2.2 **Noise level** is defined as the A-weighted energy equivalent sound pressure level measured in accordance with ISO 2923.

1.2.3 **Vibration level** is defined by application of ISO 20283-5, as the overall frequency weighted r.m.s. value of deck structure vibration during a period of steady-state operation over the frequency range 1 to 80 Hz.

1.3 Class notations

1.3.1 In addition to the hull and machinery class notations defined in *Vol 1, Pt 1, Ch 2, 3 Character of Classification and Class notations*, ships verified as compliant with these requirements will be assigned the optional notation:
CEPAC1 Crew and Embarked Personnel Accommodation Comfort Level 1; or
CEPAC2 Crew and Embarked Personnel Accommodation Comfort Level 2

1.3.2 These notations indicate that the crew and embarked personnel accommodation and work areas meet the respective acceptance criteria and provide ship Operators with an objective assessment of a ship's noise and vibration levels in accommodation and work areas throughout its life.

1.3.3 Assignment of the notation is subject to the requirements of this Chapter being complied with and maintained through-life in accordance with the requirements of *Vol 3, Pt 2, Ch 7, 7 Survey requirements*.

1.3.4 The impact of any subsequent modifications to the ship's structure or equipment resulting in any alteration to the data specified in *Vol 3, Pt 2, Ch 7, 1.4 Information and documentation required for submission* including the noise and vibration measurement results are to be submitted for review of ongoing compliance.

1.4 Information and documentation required for submission

1.4.1 The following documents are to be submitted for review and agreement prior to the noise and vibration trials being undertaken:

(a) trials condition specification (including agreed machinery settings);
(b) compartment designation and agreed assessment criteria for each space;
(c) test measurement plan, including trials conditions, test locations, instrumentation and operator competence;
(d) relevant specification requirements;
(e) acoustic insulation plan; and
(f) noise and vibration predictions and analysis techniques (optional).

1.4.2 The compartment designations, criteria and test conditions are to be agreed by the Shipyard and Owner.

1.4.3 On completion of the noise and vibration trials being undertaken, a survey report is to be submitted for acceptance in accordance with the requirements of *Vol 3, Pt 2, Ch 7, 5 Survey reporting*.

■ *Section 2*

Noise

2.1 Maximum noise levels

2.1.1 Where the measured noise level exceeds the applicable maximum noise level in *Table 7.2.1 Accommodation - maximum noise levels, in dB(A)* and *Table 7.2.2 Work areas - Maximum noise levels, in dB(A)* **by 3 dB(A), or contains subjectively annoying low frequency or tonal components**, the noise rating (NR) number is to be established in accordance with *Figure 7.2.1 Noise rating curves*. **This is achieved by plotting the linear octave band levels on the graph; the NR number is that NR curve to which the highest plotted octave band level is anywhere tangent.** The specified criterion may be considered satisfied if the NR number does not exceed the specified A-weighted value minus 5 dB(A).

2.1.2 Guidance on maximum acceptable sound pressure levels and noise exposure limits is given in *IMO Resolution MSC. 337(91) – Adoption of the Code on Noise Levels on Board Ships – (Adopted on 30 November 2012).*

2.2 Crew and embarked personnel accommodation and work areas

2.2.1 When the ship is proceeding in its agreed operating condition and in accordance with the provisions specified in *Vol 3, Pt 2, Ch 7, 4.2 Test conditions*, the noise levels specified in *Table 7.2.1 Accommodation - maximum noise levels, in dB(A)* and *Table 7.2.2 Work areas - Maximum noise levels, in dB(A)* are not to be exceeded.

2.2.2 The noise levels should preferably be predicted at design stage (optional). The predictions should include both airborne noise, structure-borne noise and noise from the ventilation system (HVAC). Where performed, the predictions should be provided to LR for information.

2.2.3 Noise predictions are recommended to be performed in accordance with ISO 9613-2 (outdoor airborne noise), ISO/TR 11690 (indoor airborne noise), statistical energy analysis (SEA) or, if appropriate, simplified methods (structure-borne noise) and the ASHRAE Applications Handbook methodologies (HVAC noise). Alternate standards or techniques may also be appropriate.

Table 7.2.1 Accommodation - maximum noise levels, in dB(A)

Location	NS1 and NS(SR) vessels		NS2, NS3 and NS(SSC) vessels	
	Comfort Level			
	1	2	1	2
Sleeping cabins, medical spaces (*see* Note 1)	52	55	55	60
Recreation areas, offices, conference rooms	55	60	60	65
Mess rooms	57	60	60	65
Open deck recreation areas (*see* Note 2)	72	75	72	75
Passageways within accommodation areas, changing rooms, communal washrooms	70	70	75	75

Note 1. Medical spaces not including beds or patient treatment facilities may be considered as offices in agreement with the Owner/Naval Administration
Note 2. The levels may be exceeded by 5 dB(A) within 3 m of a ventilation inlet/outlet or machinery intake/uptake on open decks.
Note 3. In austere/temporary accommodation higher levels could be accepted in agreement with the Owner/Naval Administration

Table 7.2.2 Work areas - maximum noise levels, in dB(A)

Location	dB(A) level
Machinery spaces (e.g. engine room, pump room, refrigeration space, thruster space or fan room) (*see* Note 1)	110
Workshops, hangars, passageways within work areas, stairwells, non-specified work spaces and open deck work spaces	85
Machinery control rooms	75
Bridge, chart rooms, conning positions, operational control rooms, and radar rooms	65
Look-out posts e.g. at bridge wing or window Additional limits: (measured according to IMO A.343(IX)) —250 Hz band —500 Hz band	70 68 63
Communication compartments (with comms equipment operating but not producing audio signals)	60
Laundries, galleys and pantries: Equipment not working Individual items at 1 m	 75 85
Normally unoccupied spaces (e.g. stores, magazines, holds, decks)	90
Ship's whistle, on bridge wings, forecastle (see COLREGS, Annex III 1.e)	110
Note 1. Where machinery spaces are continuously or periodically manned, maximum noise levels are to be consistent with the requirements for personal daily exposure limits as agreed with the Owner.	

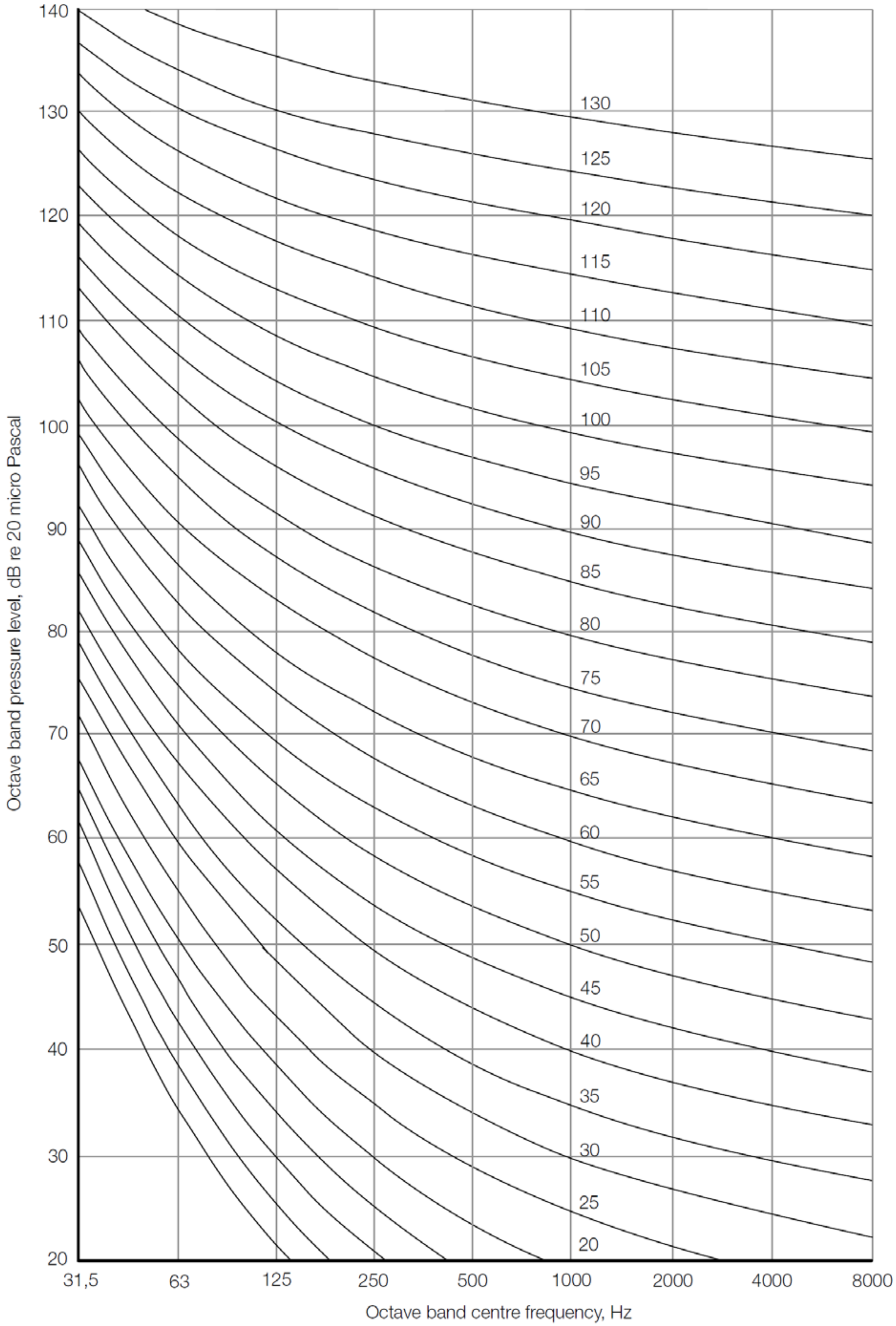

Figure 7.2.1 Noise rating curves

2.3 Acoustic insulation

2.3.1 The airborne sound insulation properties for bulkheads and decks within the accommodation area shall comply with the apparent sound reduction index (R'_w) given in *Table 7.2.3 Minimum apparent sound reduction index (R'_w)* according to the standard ISO 717-1.

Table 7.2.3 Minimum apparent sound reduction index (R'_w)

Location	R'_w	
	Comfort Level	
	1	2
Between sleeping cabins; cabins to hospitals	35	32
Mess rooms, recreation rooms, public spaces to sleeping cabins and hospitals	45	42
Corridor to sleeping cabin	30	27
Work areas to accommodation areas	45	42

2.3.2 The acoustic insulation plan shall be submitted to LR at design stage and the required sound reduction index for all relevant partitions shall be defined. Where partitions have certified R_w values and installed under survey in accordance with the manufacturer's instructions no R'_w measurements are required; the certified R_w values shall be 3 dB(A) higher than the R'_w values as per *Table 7.2.3 Minimum apparent sound reduction index (R'_w)*.

2.3.3 In other cases, or where there is doubt regarding the achievement of the certified R_w values, the airborne sound insulation properties shall be determined according to the field measurements standard ISO 16283-1 for representative partitions.

2.3.4 The sound reduction index for the partitions should preferably be predicted at design stage (optional). The predictions are recommended to be performed according to the methodology described in ISO 12354-1. Where performed, the predictions should be provided to LR for information.

2.4 General alarm and crew and embarked personnel address systems

2.4.1 The general alarm and crew and embarked personnel address systems are to comply with *Vol 3, Pt 2, Ch 7, 2.4 General alarm and crew and embarked personnel address systems 2.4.2* to *Vol 3, Pt 2, Ch 7, 2.4 General alarm and crew and embarked personnel address systems 2.4.5* together with *Vol 2, Pt 9, Ch 10, 5.1 Emergency alarm system* and *Vol 2, Pt 9, Ch 10, 4.1 Crew and embarked personnel address system*.

2.4.2 During the noise measurement programme the general alarm and crew address systems are to be demonstrated by tests. These tests are to be undertaken under the trial conditions as described in *Vol 3, Pt 2, Ch 7, 4.2 Test conditions*.

2.4.3 When the ship is proceeding in its agreed operating condition, the minimum sound pressure levels of the public-address system for broadcasting emergency announcements are to comply with the following:

(a) In interior spaces:
- 75 dB(A); and
- at least 20 dB(A) above the speech interference level.

(b) In exterior spaces:
- 80 dB(A); and
- at least 15 dB(A) above the speech interference level.

NOTE. The speech interference level is defined as the arithmetic average of the sound pressure level of the ambient noise in the four octave bands: 500 Hz, 1000 Hz, 2000 Hz and 4000 Hz.

2.4.4 The sound pressure level from the general alarm and public address system is not to exceed 120 dB(A) and should be limited to 100 dB(A) where possible.

2.4.5 If the speech interference level exceeds 90 dB(A), flashing light beacons are to be installed in the area sufficient to alert Operators to the nature of the alarm. In large spaces, or during times when machinery is not running, multiple audible calling devices should be installed to avoid shock to persons close to the source of the sound and to ensure uniform sound levels over all the space. *See also IMO Resolution A.1021(26) – Code on Alerts and Indicators, 2009 – (Adopted on 2 December 2009)*

■ *Section 3*
Vibration

3.1 Maximum vibration levels

3.1.1 The vibration parameters are defined in the standard ISO 20283-5 as the overall frequency weighted r.m.s. value of deck structure vibration during a period of steady-state operation over the frequency range 1 to 80 Hz.

3.1.2 Vibrations in the vertical and horizontal directions are to be assessed separately.

3.1.3 When the ship is proceeding in its agreed operating condition and in accordance with the provisions specified in *Vol 3, Pt 2, Ch 7, 4.2 Test conditions,* the vibration levels specified in *Table 7.3.1 Accommodation - maximum vibration levels* and *Table 7.3.2 Work areas - maximum vibration levels* are not to be exceeded.

3.1.4 The vibration levels should preferably be predicted at design stage (optional) using finite element calculation methods and should as a minimum include vibrations generated by the propulsion system, main engines and auxiliary generators. The predictions should be presented to LR for information.

Table 7.3.1 Accommodation - maximum vibration levels

Location	NS1 and NS(SR) vessels		NS2, NS3 and NS(SSC) vessels	
	Frequency weighted velocity level (1–80 Hz), mm/s r.m.s.			
	Comfort Level			
	1	2	1	2
Sleeping cabins, medical areas, recreation areas, offices, conference rooms (*see* Note 1)	3	3,5	3	4,5
Mess rooms	3,5	4,5	4,5	5
Open-deck recreation areas	3,5	4,5	4,5	5
Passageways within accommodation areas, changing rooms, communal washrooms	3,5	4,5	4,5	5
Note 1. In medical areas the Owner may have specific vibration limits which are determined by the medial equipment being used. Such limits are to be declared in the test plan.				

Table 7.3.2 Work areas - maximum vibration levels

Location	NS1 and NS(SR) Vessels		NS2, NS3 and NS(SSC) Vessels	
	Frequency weighted velocity level (1–80 Hz), mm/s r.m.s.			
	Comfort Level			
	1	2	1	2
Machinery spaces (e.g. engine room, pump room, refrigeration space, thruster space or fan room)	5	5,5	5,5	6,5
Workshops, hangars, passageways within work areas, stairwells, non-specified work spaces and open deck work spaces	5	5,5	5,5	6,5
Machinery control rooms	4	5	5	5,5
Bridge, chart rooms, conning positions, operational control rooms, and radar rooms	4	5	5	5,5
Look-out posts, e.g. at bridge wing or window	4	5	5	5,5
Communication compartments	5	5	5	5,5
Laundries, galleys and pantries	5	5,5	5,5	6,5
Normally unoccupied spaces (e.g. stores, magazines, holds, decks)	5	5,5	5,5	6,5

■ *Section 4*
Testing

4.1 Measurement procedures

4.1.1 These requirements take precedence where quoted standards may differ.

4.1.2 Prior to survey, a noise and vibration measurement plan is to be agreed by the Owner, Builder and LR.

4.1.3 The trial measurements may be undertaken by an approved technical organisation as defined in *Vol 3, Pt 2, Ch 7, 4.7 Approved Technical Organisation* or by LR. In the former case, the measurements shall be witnessed by an LR Surveyor**.**

4.2 Test conditions

4.2.1 Test conditions for the surveys are to be in accordance with those detailed in ISO 2923 and 20283-5 as applicable.

4.2.2 The intended operating conditions of the ship during assessment surveys are to be submitted to LR for agreement, prior to commencement of surveys.

4.2.3 Surveys will only be conducted when the ship is fully outfitted, and all systems contributing to noise and vibration levels are fully operational.

4.2.4 The test conditions required for the vibration and noise measurements are to be in accordance with the following conditions:

(a) Propulsion machinery operating profiles are to be submitted prior to the trials and an operating condition agreed between the Owner and LR. Noise and vibration measurements will be taken at this agreed operating condition and the comfort level assigned. This condition, or conditions, should include as a minimum the operational modes, defined in the System Operational Concept document, for the propulsion systems which provide the normal ship service speed, or normal cruising speed, *see Vol 2, Pt 1, Ch 3, 3.4 System operational concept*. The power absorbed by the propeller(s) should preferably not be less than 85 per cent of the maximum continuous rating of the propulsion machinery.
(b) All propulsion and auxiliary machinery, including HVAC systems, are to be running in their normal sea-going mode during the noise and vibration trials. Combinations of auxiliary machinery operation may be necessary in order to establish the worstcase measurement scenario.
(c) Measurements are to be taken with the ship proceeding ahead, at a constant speed and course, in a depth of water not less than five times the draught of the ship.
(d) Trials are to be conducted in sea conditions not greater than sea state 3 on the WMO sea state code.
(e) The ship is to be at a displacement and trim corresponding to the normal operating condition.
(f) Rudder angle variations are to be limited to ±2º of the midship position and rudder movements are to be kept to a minimum throughout the measurement periods.
(g) Intermittently run equipment such as transverse thrust or dynamic positioning units are not required to be operated, unless the vessel operates for a substantial period of time (>8hrs) in this mode, in which case they are to be operated at 40 per cent of their rated power for additional measurements in surrounding ship areas.
(h) In addition, for ships which are designed to spend a considerable period of time in harbour, the noise and vibration levels are to be measured for this condition, with the auxiliary machinery and HVAC systems running at their normal rated capacity.
(i) Care is needed to ensure that external sources of noise, due to aircraft for example, do not influence the noise measurement results.

4.2.5 Prior to survey, a test programme is to be submitted for approval by LR. This programme is to contain details of the following:

(a) measurement locations, indicated on a general arrangement of the ship, for sound pressure levels, vibration levels and sound insulation;
(b) the ship's outfit condition during survey;
(c) the machinery operating condition, including HVAC system, during survey;
(d) noise and vibration measuring equipment; and
(e) test site water depth.

4.3 Noise measurements

4.3.1 Noise measurements are to be conducted in accordance with ISO 2923 and *IMO Resolution MSC.337(91) – Adoption of the Code on Noise Levels on Board Ships – (Adopted on 30 November 2012)*. Measurements of noise levels are to be carried out using precision grade sound level meters conforming to IEC 61672, Type 1 or 2. Subject to demonstration, equivalent standards are acceptable. The calibration of the measurement equipment shall be verified on-site before and after the measurements.

4.3.2 Where the measured noise exceeds the relevant criteria, or contains subjectively annoying low frequency noise, or obvious tonal components, octave band readings are to be taken, with centre frequencies from 31,5 Hz to 8 kHz.

4.3.3 Measurements are to be performed to evaluate the ship with respect to sound insulation. When outfitting is complete, and all soft furnishings are in place, sound reduction indices for crew and embarked personnel spaces are to be determined in accordance with ISO 16283-1 and presented in accordance with ISO 717-1.

4.4 Noise measurement locations

4.4.1 Measurement locations are to be chosen so that assessment represents the overall noise environment on board the ship. All working areas and at least 50 per cent of the normally occupied accommodation areas in the after third of the vessel, and at least 25 per cent elsewhere, are to be surveyed. Distribution of the measurement locations is to be agreed by LR.

4.4.2 During measurement trials, recognised noise sources are to be operated at their normal level of noise output (e.g. machinery at design rating).

4.4.3 In larger sized spaces, where noise levels may vary considerably, measurements are to be taken at locations not greater than 7 m apart.

4.4.4 The extent and number of partitions to be measured for the determination of sound reduction indices should be agreed with LR before testing (typical extent 10–20 partitions). If the partition surface area is less than 10 m^2, an area of 10 m^2 shall be used in the calculations, unless otherwise agreed.

4.5 Vibration measurements

4.5.1 Vibration measurements are to be conducted in accordance with ISO 20283-5.

4.5.2 Measurements are to be made with instrumentation meeting the requirements of ISO 8041. The calibration of the measurement equipment shall be verified on-site before and after the measurements.

4.6 Vibration measurement locations

4.6.1 Measurement locations are to be chosen so that the assessment represents the overall vibration environment on board the ship. To minimise survey times, readings may be taken at the locations previously defined for the noise assessment part of the survey.

4.6.2 In cabins, vibration readings are to be taken in the centre of the floor area. The measurements are to indicate the vibration of the deck structure. In large spaces, such as mess rooms, sufficient measurements are required to define the vibration profile.

4.6.3 Where deck coverings make transducer attachment impracticable, use of a small steel plate having a mass of at least 1kg is permissible.

4.6.4 At all locations, vibrations in the vertical direction are to be assessed. Sufficient measurements in the longitudinal and transverse directions are to be taken to define global vibrations, in at least two locations on each deck.

4.7 Approved technical organisation

4.7.1 An approved technical organisation for the purposes of these Rules is one that is acceptable to the Owner and LR with proven capability in noise and vibration measurement and satisfies all the criteria set out below:

(a) Have instrumentation whose calibration, both before and after the measurements, can be traced back to National Standards.
(b) Personnel with knowledge in the field of noise, vibration, measurement techniques, equipment handling and relevant standards and Codes (including these Rules)
(c) Have analysis procedures capable of data reduction to the requirements and standards set out in these Rules.
(d) Be able to provide a written report in English with contents as defined by *Vol 3, Pt 2, Ch 7, 5, Survey reporting*.

■ *Section 5*
Survey reporting

5.1 General

5.1.1 The survey report is to comprise the data and analysis for noise, sound insulation and vibration and is to be submitted to LR for consideration.

5.1.2 The survey report shall be prepared by the organisation undertaking the trial measurements, which is to be either LR, or a technical organisation approved by LR.

5.2 Noise

5.2.1 The reporting of results is to comply with ISO 2923 and *IMO Resolution MSC.337(91) – Adoption of the Code on Noise Levels on Board Ships – (Adopted on 30 November 2012)* and is to include:

(a) The results of public address and general alarm system testing, in addition to the acoustic insulation testing.
(b) Measurement locations indicated on a general arrangement plan including, where possible, the measured dB(A) level.
(c) Tabulated dB(A) noise levels, together with octave band analysis for positions where the level exceeds the specified criterion. The NR number is also to be given where octave band analyses have been conducted. The specified criterion may be considered satisfied if the NR number does not exceed the specified A-weighted value minus 5 dB(A).
(d) Ship and machinery details.
(e) Trial details:
    - Loading condition.
    - Machinery operating condition and settings.

  - Speed.
  - Average water depth under keel.
  - Weather conditions.
  - Sea state.

(f) Details of measuring and analysis equipment (e.g. manufacturer, type and serial numbers), including frequency analysis parameters (e.g. averaging time).
(g) Copies of the relevant instrument calibration certificates, together with the results of field calibration checks.
(h) Tabulated weighted sound reduction indices and corresponding frequency spectra.

5.3 Vibration

5.3.1 The report is to contain the following information:
(a) Measurement positions indicated on a general arrangement plan.
(b) The measured overall frequency weighted r.m.s. vibration levels~~,~~ tabulated for all measurement locations and directions.
(c) Ship and machinery details.
(d) Trial details:
  - Loading condition.
  - Machinery operating condition and settings.
  - Speed.
  - Average water depth under keel.
  - Weather conditions.
  - Sea state.

(e) Details of measuring and analysis equipment (e.g. manufacturer, type and serial number), including frequency analysis parameters (e.g. resolution, averaging time and window function).
(f) Copies of the relevant instrument calibration certificates, together with the results of field calibration checks.

■ *Section 6*
Excessive noise and vibration

6.1 Noise excesses

6.1.1 Noise levels and sound reduction indices greater than those specified in these Rules may be considered. Not more than 10 per cent of the accommodation spaces or work spaces are to exceed the relevant noise criteria, with a maximum exceedance limit per space/ partition of 3 dB(A).

6.1.2 If the noise levels exceed the allowable noise criteria, at least two adjacent spaces shall be measured, including spaces on the same deck and/or on decks above and below.

6.1.3 Where the noise level in machinery spaces (or other spaces) is greater than 85 dB(A), entrances to such spaces shall be provided with an appropriate warning notice. If only a minor portion of the space has such noise levels, the particular location(s) or equipment shall be identified at eye level, visible from each direction of access.

6.2 Vibration excesses

6.2.1 Vibration levels greater than those specified in these Rules may be considered. Not more than 10 per cent of all accommodation spaces or work spaces are to exceed the relevant vibration criteria, with a maximum exceedance limit per space of 1 mm/s.

6.2.2 If the vibration levels exceed the allowable vibration criteria, at least two adjacent spaces shall be measured, including spaces on the same deck and/or on decks above and below.

■ *Section 7*
Survey requirements

7.1 Initial Survey

7.1.1 The Initial Survey shall comprise sea trial or initial in-service testing, reporting and assessment against the criteria set out in these Rules.

7.1.2 The sea trial or initial in-service testing requirements are set out in *Vol 3, Pt 2, Ch 7, 4 Testing*, and are to be reported in accordance with *Vol 3, Pt 2, Ch 7, 5 Survey reporting* and evaluated against the requirements of *Vol 3, Pt 2, Ch 7, 2 Noise and Vol 3, Pt 2, Ch 7, 3 Vibration*.

7.2 Maintenance of class notation through-life

7.2.1 Arrangements are to be agreed between LR and the Owner to record observations/complaints of excessive noise and vibration that have been such as to disturb the comfort of embarked personnel and crew. The records of the observations are to be made available to the attending LR Surveyor at each Annual Survey.

7.2.2 Where the observations indicate that the noise and/or vibration levels may exceed the criteria relating to the Class Notation requirements and those measured at the Initial Survey, a measurement programme is to be agreed between the Owner and LR and measurements taken in accordance with these Rules.

7.2.3 Notwithstanding the above, at each Renewal Survey following the Initial Survey, measurements of noise and vibration will be required at a minimum of 10 per cent of the locations specified for the Initial Survey. The locations are to be submitted to LR for agreement, prior to commencement of the Renewal Survey.

7.3 Surveys following modifications

7.3.1 A Renewal Survey may be required following modifications, alterations or repairs including replacement of major machinery items. It is the responsibility of the Owner to advise LR of such modifications.

■ *Section 8*
Referenced standards

8.1 Noise

8.1.1 The following National and International Standards for noise are referred to in these Rules:
- ISO 2923:1996/Cor 1:1997. *Acoustics – Measurement of noise on board vessels*.
- ISO 717-1:2013 *Acoustics – Rating of sound insulation in buildings and of building elements; Part 1: Airborne sound insulation*.
- IMO Resolution MSC.337(91) – *Adoption of the Code on Noise Levels on Board Ships – (Adopted on 30 November 2012)*
- IEC 61672 Sound level meters (all parts), or earlier versions.
- ISO 16283-1:2014/Amd 1:2017 *Acoustics — Field measurement of sound insulation in buildings and of building elements — Part 1: Airborne sound insulation*.

8.2 Vibration

8.2.1 The following National and International Standards for vibration are referred to in these Rules:
- ISO 20283-5:2016 *Mechanical vibration -- Measurement of vibration on ships -- Part 5: Guidelines for measurement, evaluation and reporting of vibration with regard to habitability on passenger and merchant ships.*
- ISO 8041-1:2017 *Human response to vibration -- Measuring instrumentation -- Part 1: General purpose vibration meters*
- (or earlier versions).

Volume 3, Part 3, Chapter 2
Environmental Protection

■ *Section 1*
General requirements

1.2 ENV class notation

1.2.1 **ENV** notation is assigned when the requirements for one or more of the following characters are complied with:

A	Anti-fouling coatings;
ABN	Airborne Noise;
GW	Grey water and sewage;
IHM	Inventory of Hazardous Materials;
MRV	Monitoring, reporting and verification of carbon dioxide
NOx-2, NOx-3	Emissions of nitrogen oxides;
OW	Oily water management;
P	Oil tanks in protected locations;
RS	Refrigeration systems;
SOx	Emissions of sulphur oxides;
UWN	Underwater noise.

■ *Section 2*
ENV characters

2.2 Airborne Noise – ABN character

2.2.1 For assignment of the **ABN** character, the vessel's airborne noise is to be measured and certified in accordance with LR's *ShipRight Additional Design and Construction Procedure for the determination of airborne noise emissions from marine vessels.* The limits are to be set by the applicant, or in accordance with the nominated limit set within the ShipRight procedure.

2.2.2 This notation is intended to provide a measurement of the airborne noise emissions for operation in environmentally sensitive or commercially restricted areas and is not intended to provide a means of managing noise emissions for military purposes.

Existing sub-Sections 2.2 to 2.10 have been renumbered as 2.3 to 2.11.

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